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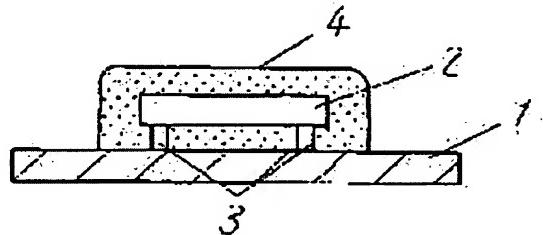
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## (54) SEMICONDUCTOR LIGHT EMITTING ELEMENT

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a semiconductor light emitting element which is superior in the transmissivity of visible light, which obtains a high luminance, which controls a chromaticity with high accuracy and which obtains photothermal durability.

SOLUTION: In the semiconductor light emitting element, electrodes of an LED chip 2 are connected to electrode patterns on a substrate 1 via bumps 3 (wires may be used), and the LED chip 2 is mounted. A phosphor 4 composed of a substance is excited by light emitted from the LED chip 2, and generates emitted light on the side of a wavelength longer than that of its excitation light. The phosphor 4 is coated so as to surround the whole circumference of the LED chip 2 mounted on the substrate 1 in a protrusion shape. The phosphor 4 is an organic phosphor composed of a compound containing at least one aromatic cyclic molecule inside one molecule, or an organic metal complex phosphor composed of a compound which uses organic molecules or inorganic molecules as a ligand around at least one typical or transition metal ion inside one molecule. As a result, it is possible to obtain the semiconductor light emitting element which can control the chromaticity with high accuracy and whose durability is high.



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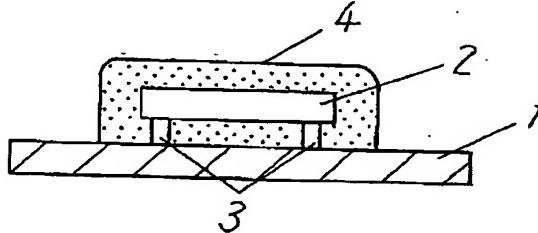
Fターム(参考) 5F041 AA11 AA33 AA44 CA40 DA09  
EE25

(54)【発明の名称】 半導体発光素子

(57)【要約】

【課題】 半導体発光素子において、可視光の透過性に優れ高輝度を得て、高度な色度管理を行い、かつ光熱耐久性を得ること。

【解決手段】 基板1上の電極パターンにバンプ3(ワイヤでもよい)を介してLEDチップ2の電極を接続したLEDチップ2を実装した半導体発光素子において、LEDチップ2から発光される光で励起されてその励起光よりも長波長側の発光を生じる物質からなる蛍光体4を、基板1上に凸状に実装されたLEDチップ2の全周を囲むように被覆した。蛍光体4は、1分子内に少なくとも1個の芳香族環状分子を含有する化合物からなる有機蛍光体または1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物からなる有機金属錯体蛍光体とする。これにより、高輝度・高精度の色度管理が可能で、かつ高耐久性の半導体発光素子が得られる。



## 【特許請求の範囲】

【請求項1】 基板上の電極パターンにLEDチップの電極を接続したLEDチップを実装した半導体発光素子において、前記LEDチップから発光される光で励起されてその励起光よりも長波長側の発光を生じる物質からなる蛍光体を、前記基板上に凸状に実装されたLEDチップの全周を囲むように被覆したことを特徴とする半導体発光素子。

【請求項2】 前記基板上の電極パターンと前記LEDチップの電極をバンプを介して接続した請求項1記載の半導体発光素子。

【請求項3】 前記蛍光体が、1分子内に少なくとも1個の芳香族環状分子を含有する化合物からなる有機蛍光体である請求項1または2に記載の半導体発光素子。

【請求項4】 前記蛍光体が、1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物からなる有機金属錯体蛍光体である請求項1または2に記載の半導体発光素子。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明は、白色光を出射する半導体発光素子に関する。

## 【0002】

【従来の技術】 従来の白色半導体発光素子(LED)としては、以下に列記する技術がある。

(1) 青色または青紫色の発光ダイオードと、この発光ダイオードの発光を吸収して可視域に発光する1種または2種以上の蛍光体とを組み合わせた白色発光素子において、発光ダイオードと蛍光体の発光色が加色して互いに補色の関係になり、白色に発光するように前記蛍光体を選択する(特開平10-163535号公報)。

(2) 発光素子を発光ダイオード・チップとした白色光源に、波長変換材料を用いて波長変換することにより演色性を向上させる(特開平11-39917号公報)。具体的には、色素ローダミン(Rhodamin)を溶解分散させたエポキシ樹脂によりLEDチップを被覆する。

(3) LEDチップ状にスパッタリング法を用いて形成された無機蛍光薄膜により一定の膜厚の蛍光層を形成する(特開平11-46015号公報)。(4) 発光ダイオードの青色光によって励起発光する蛍光体粉末と、その励起光

を散乱させる粉末を主成分とする波長変換蛍光体物質をアクリル系溶剤で混合し、指針の光導入部に塗布または印刷して色調交換層を形成して白色光を得る(特開平11-248493号公報)。

(5) 発光ダイオードに、蛍光物質を含むキャップを着脱可能に装着してLEDの発光色を白色その他の所望の色に変換させる。蛍光物質としては、蛍光体、蛍光顔

料、蛍光染料等を使用する(特開平11-87784号公報)。

(6) 窒化ガリウム系半導体LEDチップの上部に、蛍光体をエポキシ樹脂中に混合分散させたものを流し込んで硬化形成させる発光ダイオードを形成する(特開2000-252523号公報)。

(7) 蛍光体として、ポリメタクリル酸エステル等の担体にRhodamin B, Rhodamin 6G, Basic Yellow HG等の染料を溶解させた有機蛍光体を用いる(特開平11-46019号公報)。

(8) このほかにも、蛍光体として、EuやTb、Nd等の希土類錯体を用いることが提案されている(化学と工業 第53巻 第2号(2000))。

## 【0003】

【発明が解決しようとする課題】 しかしながら、上記の各従来技術においては、次のような問題点があった。

(1) 特開平10-163535号公報に開示された技術においては、蛍光体は無機粉末であり、可視光散乱は避けられず、高輝度化に難があつた。

20 (2) 特開平11-39917号公報に開示された技術においては、凹部に色素溶解した樹脂を流し込む形態で、加工性に難があり、高精度な色度管理が難しい。

(3) 特開平11-46015号公報に開示された技術においては、スパッタリング法によるため、真空蒸着装置を必要とし、高額な設備を要する。

(4) 特開平11-248493号公報に開示された技術においては、青色励起光源と蛍光体層の距離があり、励起光が減少し、輝度が低下する。

(5) 特開平11-87784号公報に開示された技術においては、キャップ状の蛍光体含有被覆物は光源からの距離があり、励起光の減少で高輝度化が難しい。

(6) 特開2000-252523号公報に開示された技術においては、2段の凹部に樹脂と共に蛍光体を流し込み、その沈降によるものであり、発光の色度管理に難がある。

(7) 前記(7)項および(8)項において開示された技術においては、単なる有機成分のみの蛍光色素よりも耐久性に優れたものであるが、PMMA固体中に溶解、固化したものであり微小なLED表面上へ加工・実装の操作性に問題がある。

40 【0004】 本発明は、上記のような問題点を解消するものであり、励起光と蛍光とともに透過性に優れ、光散乱が適切になされることにより、高輝度かつ高度に管理された色度を得て、光熱耐久性の高い半導体発光素子を得ることを目的とする。

## 【0005】

【課題を解決するための手段】 本発明の半導体発光素子においては、基板上の電極パターンにLEDチップの電極を接続したLEDチップを実装した半導体発光素子において、前記LEDチップから発光される光で励起され

てその励起光よりも長波長側の発光を生じる物質からなる蛍光体を、前記基板上に凸状に実装されたLEDチップの全周を囲むように被覆したものである。

【0006】この発明によれば、LEDチップから発光され、蛍光体を励起することなく透過した光の一部と、LEDチップから発光され蛍光体を励起して励起光よりも長波長となった光とが互いに補色関係となるようにすることにより、白色発光する半導体発光素子が得られる。

#### 【0007】

【発明の実施の形態】本発明の請求項1に記載の発明は、基板上の電極パターンにLEDチップの電極を接続したLEDチップを実装した半導体発光素子において、前記LEDチップから発光される光で励起されてその励起光よりも長波長側の発光を生じる物質からなる蛍光体を、前記基板上に凸状に実装されたLEDチップの全周を囲むように被覆したものであり、LEDチップから発光され、蛍光体を励起することなく透過した光の一部と、LEDチップから発光され蛍光体を励起して励起光よりも長波長となった光とが互いに補色関係となるようにすることにより、白色発光するという作用を有する。

【0008】請求項2に記載の発明は、基板上の電極パターンとLEDチップの電極をバンプを介して接続した構成とするもので、フリップチップ法を用いた製造方法が適用できるという作用を有する。

【0009】請求項3に記載の発明は、前記蛍光体が、1分子内に少なくとも1個の芳香族環状分子を含有する化合物からなる有機蛍光体であり、有機蛍光体は溶媒・樹脂などに溶解、分散が容易であるという作用を有する。

【0010】請求項4に記載の発明は、前記蛍光体が、1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物からなる有機金属錯体蛍光体であり、有機金属錯体蛍光体は溶媒・樹脂などに溶解、分散が容易であるという作用を有する。

【0011】以下、本発明の実施の形態について、図1を用いて説明する。

【0012】(実施の形態) 図1は本発明の実施の形態による半導体発光素子の構成を示す断面図であり、図1において1はツェナーダイオードからなるLED基板、2はGaN系化合物からなるLEDチップ、3はLED基板1に形成されたアノード配線およびカソード配線とLEDチップ2の電極とを接続するためのバンプ、4はLEDチップ2の全周を覆うように被覆された蛍光体である。なお、アノード配線およびカソード配線とLEDチップ2の電極とを接続する手段として、バンプを用いたフリップチップ実装のほかにワイヤーを用いた実装方法を用いることもできる。

【0013】この半導体発光素子の製造工程の例を、図

2に示す工程図にしたがって説明する。図2(a)に示すように、LEDチップ2は、LED基板1上に、フリップチップボンディング(FCB)、あるいはワイヤーボンディング等の工程により形成され、LEDチップ2がバンプ3によってLED基板1上に浮き上がった状態に固定されている。

【0014】次に、図2(b)に示すように、蛍光体4をLEDチップ2の全周を被覆するようにLED基板1上に形成する。

【0015】次に、図2(c)に示すように、形成された蛍光体4の膜を研削工具10で回転研削する。

【0016】最後に、図2(d)に示すように、カッタ11でダイシングし、個々のLED素子にカットする。

【0017】以上の工程により、蛍光体4がLEDチップ2の周りに形成される。

【0018】なお、図2(b)の蛍光体4を形成する方法としては、次のような手法を用いることができる。

##### (1) スクリーン印刷法

これは、色素を溶解・分散させたペーストを、マスクを通してパターン印刷する方法である。

##### (2) インクジェット方式

これは、加熱・圧縮・電圧印加等の方法で、色素を溶解・分散したインクを吹き付ける方法である。

##### (3) 静電吸着法

これは、色素の粉体(固体)を帯電させ、LED上面に静電的に吸着させ、その後コーティングを施すものである。

##### (4) 樹脂中分散法

これは、LEDを覆う樹脂中に色素を溶解・分散させるもので、樹脂の実装はポッティング、流し込み等を行う。

##### (5) LB法

これは、色素を2極性化して界面活性を与えて水面展開し、単分子膜を作り、その膜をLED基板で引き上げると同時に付着させる方法である。

##### (6) キャスト法

これは、色素を溶解・分散させた樹脂をキャスト(滴下)して形成し、基板を回転させて薄膜化するものである。

##### (7) フィルム貼付法

これは、あらかじめ溶解したフィルムを貼り付け、チップLEDごとカットするものである。

##### (8) 沈降法

これは、凹部に樹脂を注入し、そこへ色素固体を沈降させる方法である。

##### (9) 蒸着法

これは、前記色素を膜厚5nm~5μmに薄膜化する方法であり、均質かつピンホールが生成しにくいなどの点から、真空蒸着法が望ましい。薄膜化にこの蒸着法を用いる場合は、使用する色素化合物の種類、分子堆積膜

の目的とする結晶構造、会合構造により異なる。

【0019】

【実施例】以下、本発明の実施例について説明する。

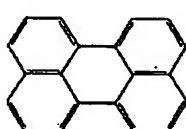
【0020】(実施例1) 蛍光体4を有機化合物とした実施例について説明する。有機化合物としては、1分子内に少なくとも1個の芳香族環状分子を含有する化合物を用いる。この化合物には、ペリレン、クマリン、エオシン、ローダミン6G等がある。

【0021】これらの化合物の化学式は次の通りである。

【0022】

【化1】

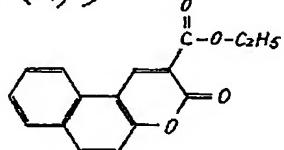
ペリレン



【0023】

【化2】

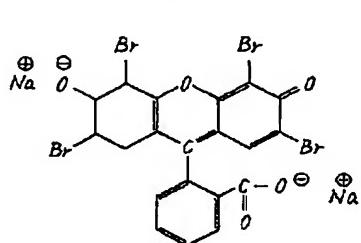
クマリン



【0024】

【化3】

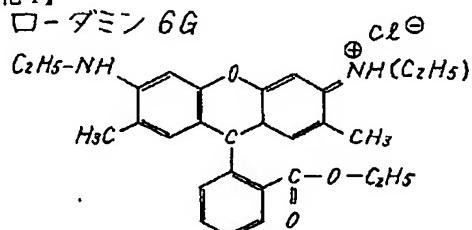
エオシン



【0025】

【化4】

ローダミン6G



【0026】これらの化合物は、少なくとも1個の芳香族環状分子を含むことにより、この芳香族環状分子が螢

光を発するときに遷移する光電子の源として作用し、LEDチップからの光で励起され、より長波長の蛍光を発するという効果が得られる。

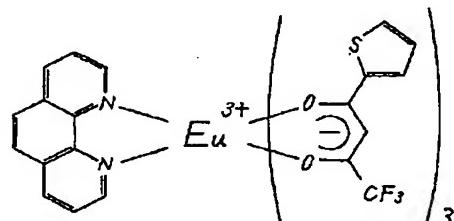
【0027】(実施例2) 蛍光体4を有機金属錯体とした実施例について説明する。有機金属錯体としては、1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物を用いる。この化合物には、Eu(TTA)<sub>3</sub>phen、Tb(acac)<sub>3</sub>phen等がある。

10 【0028】これらの化合物の化学式は次の通りである。

【0029】

【化5】

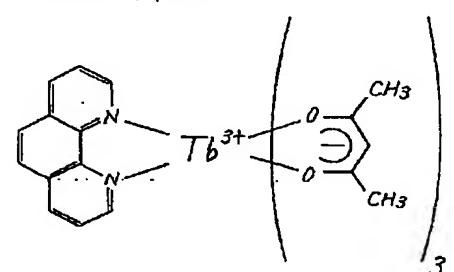
$Eu(TTA)_3phen$



【0030】

【化6】

$Tb(acac)_3phen$



【0031】これらの化合物において、1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物を含むことにより、この配位子が中心金属の電子を配位子側に引き寄せるまたは退ける作用をし、中心金属の遷移電子に影響を及ぼし、蛍光を発するという効果が得られる。

【0032】

【発明の効果】以上のように本発明によれば、LEDチップから発光される光で励起されてその励起光よりも長波長側の発光を生じる物質からなる蛍光体を、基板上に凸状に実装されたLEDチップの全周を囲むように被覆したことにより、蛍光体部分が光透過に優れて高輝度を得られ色度管理が高精度かつ耐久性に優れるという有利な効果が得られる。

【0033】また、基板上の電極パターンとLEDチップの電極をバンプを介して接続することにより、フリップチップ法を用いた製造方法が適用できる。

【0034】前記蛍光体を、1分子内に少なくとも1個の芳香族環状分子を含有する化合物からなる有機蛍光体とすることにより、溶媒・樹脂などに溶解、分散が容易な蛍光体を用いることができる。

【0035】前記蛍光体を、1分子内に少なくとも1個の典型もしくは遷移金属イオンを中心に、有機分子もしくは無機分子を配位子とする化合物からなる有機金属錯体蛍光体とすることにより、溶媒・樹脂などに溶解、分散が容易な蛍光体を用いることができる。

\* 【図面の簡単な説明】

【図1】本発明の実施の形態による半導体発光素子の構成を示す断面図

【図2】本発明の実施の形態における半導体発光素子の製造工程を示す工程図

【符号の説明】

1 LED基板

2 LEDチップ

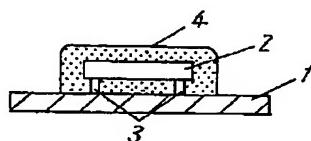
3 バンプ

4 蛍光体

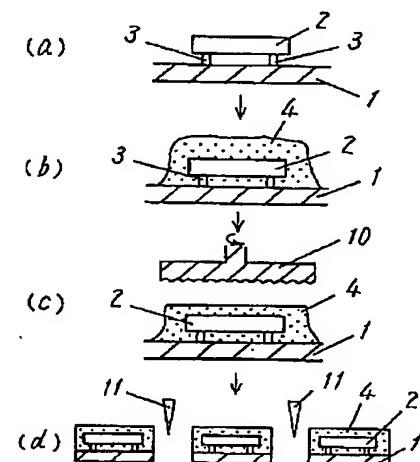
10 研削工具

\* 11 カッタ

【図1】



【図2】



# PATENT ABSTRACTS OF JAPAN

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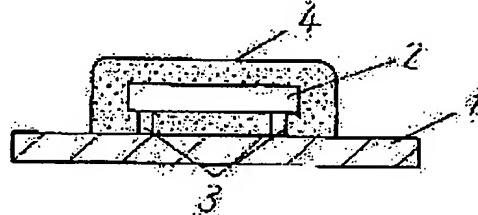
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## (54) SEMICONDUCTOR LIGHT EMITTING ELEMENT

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a semiconductor light emitting element which is superior in the transmissivity of visible light, which obtains a high luminance, which controls a chromaticity with high accuracy and which obtains photothermal durability.

**SOLUTION:** In the semiconductor light emitting element, electrodes of an LED chip 2 are connected to electrode patterns on a substrate 1 via bumps 3 (wires may be used), and the LED chip 2 is mounted. A phosphor 4 composed of a substance is excited by light emitted from the LED chip 2, and generates emitted light on the side of a wavelength longer than that of its excitation light. The phosphor 4 is coated so as to surround the whole circumference of the LED chip 2 mounted on the substrate 1 in a protrusion shape. The phosphor 4 is an organic phosphor composed of a compound containing at least one aromatic cyclic molecule inside one molecule, or an organic metal complex phosphor composed of a compound which uses organic molecules or inorganic molecules as a ligand around at least one typical or transition metal ion inside one molecule. As a result, it is possible to obtain the semiconductor light emitting element which can control the chromaticity with high accuracy and whose durability is high.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1]In a semiconductor light emitting element which mounted a LED tip which connected an electrode of a LED tip to an electrode pattern on a substrate, A semiconductor light emitting element covering so that the perimeter of a LED tip mounted in the shape of [ said ] substrate convex in a fluorescent substance which consists of a substance which is excited with light which emits light from said LED tip, and produces luminescence by the side of long wavelength rather than the excitation light may be surrounded.

[Claim 2]The semiconductor light emitting element according to claim 1 which connected an electrode of said LED tip with an electrode pattern on said substrate via a vamp.

[Claim 3]The semiconductor light emitting element according to claim 1 or 2 which is an organic fluorescent substance in which said fluorescent substance becomes 1 intramolecular from a compound containing at least one aromatic ring-like molecule.

[Claim 4]The semiconductor light emitting element according to claim 1 or 2 in which said fluorescent substance is an organometallic complex fluorescent substance which becomes 1 intramolecular from a ligand and a compound consisting mainly of at least one type or a transition metal ion. [ molecule / an organic molecule or / inorganic ]

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the semiconductor light emitting element which emits white light.

**[0002]**

**[Description of the Prior Art]** There is art listed below as a conventional white semiconductor light emitting element (LED).

(1) In the white light element which combined a blue or bluish purple light emitting diode and one sort or two sorts or more of fluorescent substances which absorb luminescence of this light emitting diode and emit light to a visible range, The luminescent color of a light emitting diode and a fluorescent substance adds colors, and it becomes a relation of the complementary color mutually, and said fluorescent substance is chosen so that light may be emitted white (JP,10-163535,A).

(2) Raise color rendering properties by using a wavelength conversion material for the white light source which made the light emitting device the light emitting diode chip, and carrying out wavelength changing to it (JP,11-39917,A). Specifically, a LED tip is covered with the epoxy resin which carried out dissolution distribution of the coloring matter rhodamine (Rhodamin).

(3) Form the fluorescence layer of fixed thickness with the inorganic fluorescent thin film which used sputtering process in the shape of a LED tip, and was formed (JP,11-46015,A). (4) By the blue glow of a light emitting diode, the wavelength changing phosphor material which uses as the main ingredients the phosphor powder which carries out excited light, and the powder over which the excitation light is scattered is mixed with an acrylic solvent, apply or print to photoconductive admission into a club of an indicator, form a color tone austausch layer, and acquire white light (JP,11-248493,A).

(5) Equip a light emitting diode with the cap containing a fluorescent substance removable, and make it change the luminescent color of LED into the color of a request of white and others. As a fluorescent substance, a fluorescent substance, a fluorescent pigment, fluorescent dye, etc. are used (JP,11-87784,A).

(6) Form the light emitting diode to which the upper part of a gallium nitride system semiconductor LED tip is made to slush and carry out curing formation of what carried out mixture dispersion of the fluorescent substance into the epoxy resin (JP,2000-252523,A).

(7) Use the organic fluorescent substance in which carriers, such as polymethacrylic acid ester, were made to dissolve colors, such as Rhodamin B, Rhodamin 6G, and Basic Yellow HG, as a fluorescent substance (JP,11-46019,A).

(8) In addition, using rare earth complexes, such as Eu, Tb, Nd, is proposed as a fluorescent substance (chemicals and industry volume [ 53rd ] No. 2 (2000)).

**[0003]**

**[Problem(s) to be Solved by the Invention]** However, there were the following problems in each of above-mentioned conventional technologies.

(1) In the art indicated by JP,10-163535,A, the fluorescent substance was inorganic powder, visible light scattering was not avoided but the rise in luminosity had difficulty.

- (2) In the art indicated by JP,11-39917,A, it is a gestalt which slushes into a crevice the resin which carried out the coloring matter dissolution, and processability has difficulty and highly precise chromaticity management is difficult.
- (3) In the art indicated by JP,11-46015,A, since it is based on sputtering process, need a vacuum evaporator and require big-ticket equipment.
- (4) In the art indicated by JP,11-248493,A, there is distance of the blue excitation light source and a fluorescent substance layer, excitation light decreases, and luminosity falls.
- (5) In the art indicated by JP,11-87784,A, the fluorescent substance content coating of cap shape has the distance from a light source, and a rise in luminosity is difficult for it at reduction in excitation light.
- (6) In the art indicated by JP,2000-252523,A, a fluorescent substance is slushed into two steps of crevices with resin, it is based on the sedimentation, and chromaticity management of luminescence has difficulty.
- (7) In the art indicated in the aforementioned (7) paragraph and (8) paragraphs, although the fluorochrome of only a mere organic component is excelled in endurance, it dissolves and solidifies in a PMMA solid and there is a problem in the operativity of processing and mounting to up to the minute LED surface.

[0004]An object of this invention is to obtain the chromaticity managed high-intensity and highly, and to obtain a semiconductor light emitting element with high light-and-heat endurance by canceling the above problems, and excitation light and fluorescence being excellent in permeability, and making light scattering appropriately.

[0005]

[Means for Solving the Problem]In a semiconductor light emitting element which mounted a LED tip which connected an electrode of a LED tip to an electrode pattern on a substrate in a semiconductor light emitting element of this invention, It covers so that the perimeter of a LED tip mounted in the shape of [ said ] substrate convex in a fluorescent substance which consists of a substance which is excited with light which emits light from said LED tip, and produces luminescence by the side of long wavelength rather than the excitation light may be surrounded.

[0006]When making it a part of light penetrated without having emitted light from a LED tip and exciting a fluorescent substance and light which emitted light from a LED tip, excited a fluorescent substance, and became long wavelength rather than excitation light serve as complementary color relation mutually according to this invention, a semiconductor light emitting element which carries out white light is obtained.

[0007]

[Embodiment of the Invention]In the semiconductor light emitting element in which the invention of this invention according to claim 1 mounted the LED tip which connected the electrode of the LED tip to the electrode pattern on a substrate, The fluorescent substance which consists of a substance which is excited with the light which emits light from said LED tip, and produces luminescence by the side of long wavelength rather than the excitation light, A part of light penetrated without having covered so that the perimeter of the LED tip mounted in the shape of [ said ] substrate convex might be surrounded, having emitted light from the LED tip, and exciting a fluorescent substance. It has the operation of carrying out white light, by making it the light which emitted light from the LED tip, excited the fluorescent substance, and became long wavelength rather than excitation light serve as complementary color relation mutually.

[0008]The invention according to claim 2 considers the electrode pattern on a substrate, and the electrode of a LED tip as the composition connected via the vamp, and has the operation that the manufacturing method using the flip chip method is applicable.

[0009]The invention according to claim 3 is an organic fluorescent substance in which said fluorescent substance becomes 1 intramolecular from the compound containing at least one aromatic ring-like molecule, and an organic fluorescent substance has the operation that the dissolution and distribution are easy, to a solvent, resin, etc.

[0010]Said fluorescent substance the invention according to claim 4 to 1 intramolecular centering on at least one type or a transition metal ion, It is an organometallic complex fluorescent substance which consists of a compound which makes an organic molecule or an

inorganic molecule a ligand, and an organometallic complex fluorescent substance has the operation that the dissolution and distribution are easy, to a solvent, resin, etc.

[0011]Hereafter, an embodiment of the invention is described using drawing 1.

[0012](Embodiment) Drawing 1 is a sectional view showing the composition of the semiconductor light emitting element by an embodiment of the invention. The LED substrate which 1 becomes from a zener diode in drawing 1, the LED tip in which 2 consists of a GaN system compound, A vapp for 3 to connect the anode wiring and the cathode wiring, and the electrode of LED tip 2 which were formed in LED substrate 1, and 4 are the fluorescent substances covered so that the perimeter of LED tip 2 might be covered. The mounting method which used the wire other than flip chip mounting which connects anode wiring and cathode wiring, and the electrode of LED tip 2 using the vapp as a means can also be used.

[0013]The example of the manufacturing process of this semiconductor light emitting element is explained according to process drawing shown in drawing 2. As shown in drawing 2 (a), LED tip 2 was formed of processes, such as flip chip bonding (FCB) or wirebonding, on LED substrate 1, and has adhered to the state where LED tip 2 came floating on LED substrate 1 by the vapp 3.

[0014]Next, as shown in drawing 2 (b), the fluorescent substance 4 is formed on LED substrate 1 so that the perimeter of LED tip 2 may be covered.

[0015]Next, as shown in drawing 2 (c), rotation grinding of the film of the formed fluorescent substance 4 is carried out by the grinding tool 10.

[0016]Finally, as shown in drawing 2 (d), dicing is carried out with the cutter 11 and it cuts into each LED element.

[0017]The fluorescent substance 4 is formed in the surroundings of LED tip 2 of the above process.

[0018]The following techniques can be used as a method of forming the fluorescent substance 4 of drawing 2 (b).

- (1) screen printing -- this is the method of carrying out pattern printing of the paste which dissolves and distributed coloring matter through a mask.
- (2) an inkjet method -- this is methods, such as heating, compression, and voltage impressing, and is the method of spraying the ink which dissolved and distributed coloring matter.
- (3) an electrostatic adsorption process -- this electrifies the granular material (solid) of coloring matter, and make it stick to the LED upper surface electrostatically, and it coats it after that.
- (4) the dispersion method in resin -- this dissolves and distributes coloring matter for LED in wrap resin, and perform mounting of resin by potting, casting, etc.
- (5) the LB method -- this is the method of making it adhere at the same time bipolar-sexuality-ize coloring matter, and give surface activity, it carries out water surface deployment, it makes a monomolecular film and it pulls up the film by a LED substrate.
- (6) the cast method -- this carries out the cast (dropping) of the resin which dissolves and distributed coloring matter, forms it, rotates a substrate, and thin-film-ize it.
- (7) the film sticking method -- this sticks the film which dissolved beforehand and cuts it the whole chip LED.
- (8) a sedimentation method -- this is the method of pouring resin into a crevice and making a coloring matter solid sedimenting there.
- (9) vacuum deposition -- it is the method of thin-film-izing said coloring matter to 5 nm - 5 micrometers of thickness, and this is homogeneous and the point of being hard to generate a pinhole to a vacuum deposition method is desirable. When using this vacuum deposition for thin film-ization, it changes with the kind of pigment compound to be used, the crystal structure made into the purpose of a molecule deposited film, and meeting structures.

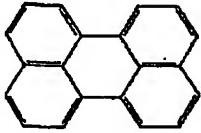
[0019]

[Example]Hereafter, the example of this invention is described.

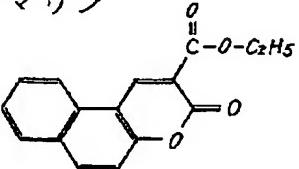
[0020](Example 1) The example which used the fluorescent substance 4 as the organic compound is described. As an organic compound, the compound containing at least one aromatic ring-like molecule is used for 1 intramolecular. There are perylene, a coumarin, eosine, rhodamine 6G, etc. in this compound.

[0021]The chemical formula of these compounds is as follows.

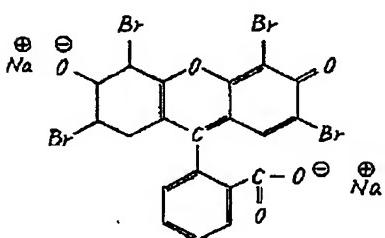
[0022]

[Formula 1] 

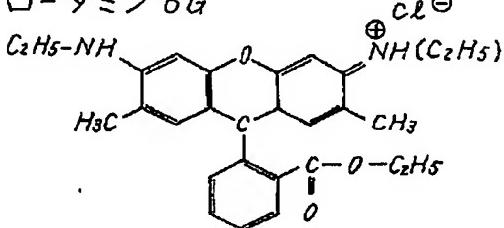
[0023]

[Formula 2] 

[0024]

[Formula 3] 

[0025]

[Formula 4] 

[0026] These compounds act as a source of the photoelectron which changes when this aromatic ring-like molecule shows a fluorescence by including at least one aromatic ring-like molecule, it is excited with the light from a LED tip, and the effect of showing a fluorescence of long wavelength more is acquired.

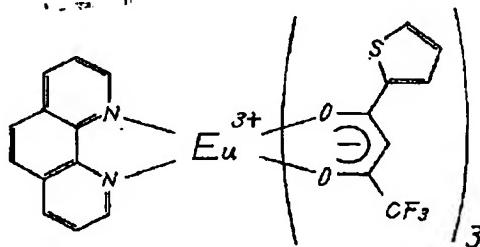
[0027] (Example 2) The example which made the fluorescent substance 4 the organometallic complex is described. As an organometallic complex, the ligand and compound consisting mainly of at least one type or a transition metal ion are used for 1 intramolecular. [ molecule / an organic molecule or / inorganic ] There are Eu(TTA)<sub>3</sub>Phen, Tb(acac)<sub>3</sub>Phen, etc. in this compound.

[0028] The chemical formula of these compounds is as follows.

[0029]

[Formula 5]

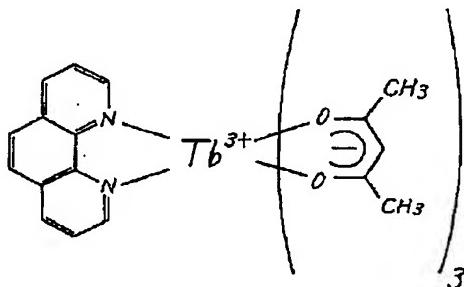
*Eu(TTA)<sub>3</sub>phen*



[0030]

[Formula 6]

*Tb(acac)<sub>3</sub>phen*



[0031] In these compounds, by including the ligand and compound consisting mainly of at least one type or a transition metal ion in 1 intramolecular, [ molecule / an organic molecule or / inorganic ] This ligand carries out the operation which draws the electron of a central metal near to the ligand side, or turns it down, the transition electron of a central metal is affected, and the effect of showing a fluorescence is acquired.

[0032]

[Effect of the Invention] As mentioned above, it covered with this invention so that the perimeter of the LED tip mounted in the shape of substrate convex in the fluorescent substance which consists of a substance which is excited with the light which emits light from a LED tip, and produces luminescence by the side of long wavelength rather than the excitation light might be surrounded.

Therefore, the advantageous effect that a fluorescent substance portion is excellent in light transmission, high-intensity can be obtained and chromaticity management is excellent in high degree of accuracy and endurance is acquired.

[0033] The manufacturing method using the flip chip method is applicable by considering the electrode pattern on a substrate, and the electrode of a LED tip as the composition connected via a vamp.

[0034] A fluorescent substance with easy dissolution and distribution can be used for a solvent, resin, etc. by using said fluorescent substance as the organic fluorescent substance which becomes 1 intramolecular from the compound containing at least one aromatic ring-like molecule.

[0035] A fluorescent substance with easy dissolution and distribution can be used for a solvent, resin, etc. by using said fluorescent substance as the organometallic complex fluorescent substance consisting mainly of at least one type or a transition metal ion which consists an organic molecule or an inorganic molecule of a ligand and a compound at 1 intramolecular.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1]The sectional view showing the composition of the semiconductor light emitting element by an embodiment of the invention

[Drawing 2]Process drawing showing the manufacturing process of the semiconductor light emitting element in an embodiment of the invention

**[Description of Notations]**

- 1 LED substrate
- 2 LED tip
- 3 Vamp
- 4 Fluorescent substance
- 10 Grinding tool
- 11 Cutter

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[Translation done.]